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Problems and Countermeasures in the Development of China's Artificial Intelligence Industry

Xinyu Gu

The Affiliated International School of Shenzhen Unilink(ZHID), Shenzhen, China
sherrie103@outlook.com

Abstract. China's artificial intelligence (AI) industry is a core driving force for high-quality economic development and technological innovation. It has made great progress in technological research and industrial application. But it is developing very fast, and industry also has serious problems. These include relying heavily on imported high-end AI chips, not having good enough data governance and privacy protection systems, and lacking a lot of professional talents. These problems stop its independent and sustainable development. This paper analyzes these core problems in a systematic way, finds out their root causes, and puts forward targeted solutions. The research shows that promoting market-oriented reform of the AI industry, building a multi-level AI security and privacy protection system, and setting up a multi-dimensional talent training mechanism are key to solving development bottlenecks. This study not only helps reduce risks like industrial chain dependence and data security dangers but also provides practical ways for policy makers. It is very important for promoting the independent, standardized, and high-quality development of China's AI industry.

Keywords: Artificial Intelligence Industry, High-End AI Chips, Data Governance, AI Talents, China.

1. Introduction

The AI industry plays a role in driving the fourth industrial revolution globally by leading technological competition and economic change significantly impacting industry advancement and societal wellbeing with the ongoing technological revolution and industrial shift, towards deep learning and intelligent cross domain integration that is transforming how people live and work today. Enhancing technological competitiveness has emerged as a crucial element for improving resource allocation efficiency and fostering high quality economic development across various sectors such as manufacturing, healthcare and finance, through driving innovation [1]. It also creates new business forms and models like smart cities, autonomous driving and intelligent robots [2]. It is changing the global industrial pattern and economic growth model. It plays an irreplaceable role in promoting scientific and technological breakthroughs, improving efficiency of social operation and dealing with global challenges like aging and environmental protection. It is very important for countries to recognize their strategic value. This can help them seize the technological development opportunity and gain an advantage in future competition.

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Since the 21st century, China has paid great attention to the development of the AI industry. In 2015, the "Made in China 2025" plan clearly listed AI as a key development area. This marked that AI officially became a national strategic priority [3]. In 2017, the "New Generation Artificial Intelligence Development Plan" further set a goal: to make China a world leader in AI innovation by 2030 [3]. It provided top-level design for industrial development [4]. In recent years, there has been strong policy support. R&D investment has kept increasing. There is also the advantage of a huge application market. With these, China's AI industry has achieved leapfrog development. In 2023, the industry scale exceeded 500 billion yuan, with a year-on-year growth rate of over 20%. Core technologies like computer vision and natural language processing have made breakthroughs. Several prominent companies such as Baidu, Alibaba and Tencent have surfaced. AI technology has found applications across different sectors. Enhanced medical diagnostics through AI have boosted treatment effectiveness. AI driven agriculture has led to crop yields. Efficient transportation systems have eased traffic congestion. Personalized teaching is achievable, through education technology. The rapid growth of the AI sector has not fueled China’s economy but also significantly improved living standards and bolstered national competitiveness.

Despite the expansion of China’s AI sector. There are obstacles and hurdles hindering its consistent and top-notch progress. Firstly, heavy reliance is placed upon imported high end AI chips. With over 80% of these chips being brought in from abroad. This reliance renders the industry vulnerable to global supply chain uncertainties and technological constraints. Secondly, the data management framework is still lacking in completeness. With mechanisms for safeguarding privacy. This deficiency results in issues such as data harvesting and biased algorithms. The infringement on user rights and erosion of confidence in AI technology have effects on society as a whole. Moreover, there exists a deficiency in skilled professionals, particularly evident in critical sectors such as AI hardware and foundational algorithms. The current training of talent fails to align with industry demands, thereby exacerbating the constraints on development. These challenges do not impede China’s progress in fostering independent innovation within the AI sector but also pose potential threats to industrial security and sustained growth [5]. The purpose of this research is to examine the fundamental issues within the growth of China’s AI sector by delving into various factors such as technology advancements and talent pool analysis comprehensively and looking at how international practices can be integrated with China’s unique developmental context to propose tailored strategies and reform directions aimed at fostering a healthy and self-sustaining environment, for China’s AI industry growth both on a theoretical and practical level.

2. Problems

2.1. High dependence on imported high-end AI chips

China’s artificial intelligence sector heavily relies on foreign made chips to power its computing functions with more than 80% of advanced AI chips being sourced from overseas markets [6]. This dependency leaves the industry vulnerable to disruptions in supply chains and technology embargoes, hindering its capacity to develop core technologies autonomously despite having numerous domestic AI use cases and a sizable market within the country. The company has not yet developed its system for crucial tasks such as chip design and advanced manufacturing processes [7-8]. This limitation hinders the depth and speed of technological advancements and poses risks to the security of the industrial supply chain. China Customs data shows that from January to July 2024, China imported 308.1 billion chips. These chips are worth about $212 billion. Compared to the same period last year, the number is up 14.5% and the value is up 11.5%. The United States might put new

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restrictions on High-Bandwidth Memory (HBM) chips. This makes domestic companies want to stock up more integrated circuits. A Bernstein report says China's demand for AI chips will hit $39.5 billion in 2025. Even if NVIDIA starts selling H20 chips again, there will still be a $2.5 billion shortage for the whole year. This underscores the severity of the issue.

2.2. Inadequate data governance and privacy protection mechanisms

AI technology is updating fast. But its governance system is falling behind, and privacy protection methods are not complete [9]. AI is being used more and more in people's daily lives and business areas. This often brings risks like data leaks and unfair algorithms. These risks harm personal rights and social order [10]. Ideally, how strict governance is should match the speed of tech innovation. This can balance security and development. But China's AI governance has problems. The rules aren't detailed enough, and supervision across different fields doesn't coordinate well. This makes the scope of tech use unclear in some cases [11]. Development is pushed by local application needs, not the "balance between security and innovation" rule. To make tech work faster, some companies simplify data compliance steps for AI projects. They don't have long-term privacy protection methods. Tests from the Computer Information System Security Product Quality Supervision and Inspection Center of the Ministry of Public Security show that domestic AI apps collect information illegally. For example, "Zhipu Qingyan" collects more personal information than it's allowed to. Kimi collects information too often, and this has nothing to do with its business functions. These actions violate users' privacy rights. Companies also struggle with managing data compliances, exacerbating the conflict between utilizing technology and ensuring security measures are in place.

2.3. Shortage of professional talents in AI field

China's AI sector is facing a shortage of professionals particularly in the AI chip domain due to the rapid advancement in industrial technology and expansion of production capacity leading to a significant surge in vacancies for key roles hampering industrial progress at present universities continue to employ conventional methods, for talent development with courses failing to keep pace with the evolving technology landscape. So, the talents they turn out depend on discipline systems, not the real needs of the industry. To fill the job openings, companies mostly use "project-based teaching" for urgent training. They give short-term skill courses to barely meet current R&D needs. But this way goes against the long-term growth rules of chip talents. It also makes the conflict between industrial development and talent reserves worse. Global AI technology is updating faster, and industrial applications are expanding. This makes the mismatch between domestic talent supply and demand obvious—especially for interdisciplinary talents and basic research talents. Basic research talents are needed to break through weak points like original algorithms and localization of high-end AI chips. At the same time, the combination of AI and industries has created a huge need for interdisciplinary talents. It's common for companies to pick talents with high salaries. For example, in December 2024, Xiaomi offered an annual salary of 10 million yuan to recruit AI talents. McKinsey predicts that China's AI talent gap will hit 4 million by 2030. In 2023, over 500 universities set up AI majors. But the 2024 Undergraduate Employment Report shows that AI positions still need support from traditional majors. Besides, graduates from research-oriented universities majoring in computer and electronic information are only 81% and 83% satisfied with core courses. These rates are lower than the national average. This shows that talent training quality and structure have urgent problems to solve.

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3. Solutions

3.1. Promote market-oriented reform and reduce policy intervention

Firstly, deepen market-oriented reform across the entire chain. Focus on the whole process of core technology R&D, achievement transformation, and market application, with the goal of strengthening independent innovation and improving the industrial collaborative ecosystem. Promote the reform of supporting industrial systems towards marketization and convenience, optimize the allocation of AI resources, enhance industrial competitiveness and vitality, and give full play to the market's role in industrial development.

Secondly, reduce direct government intervention. Mainstream media and government departments should reduce direct intervention in the AI industry's technological routes and market layout, avoid forming a single development expectation, and build an institutional framework led by market mechanisms. Abandon the "policy-led technological direction" model, guide enterprises to follow the laws of technological innovation, rationally analyze market demand, and make reasonable plans for R&D and production to prevent blind following and resource misallocation.

Thirdly, clarify the government's positioning and supervision focus. The government needs to transform from an "industrial promoter" to a "supervisor" and "service provider," performing its supervisory duties and public service obligations. It should clarify its policy positioning in ensuring independent and controllable industrial development, protecting enterprises' innovation rights and interests, and safeguarding industrial security. Meanwhile, strengthen guidance and supervision on R&D investment in core technologies such as high-end chips and key algorithms, standardize the transparent development of technology R&D and market applications, and reduce path dependence on imported technologies.

Fourthly, improve the legal guaranteed system. Regulate the behaviors of AI industry participants (R&D enterprises, application institutions, and supervision departments) from a legislative perspective to reduce industrial shocks caused by technical barriers, information asymmetry, and import dependence risks. Clarify the purpose of government intervention (safeguarding industrial security and promoting independent innovation) and reduce decision-making costs. In addition, accelerate the improvement of AI supervision regulations, severely punish behaviors that damage technical security and the independent innovation ecosystem, and achieve comprehensive supervision over core technology R&D, market application risks, and hidden dangers of import dependence.

3.2. Multi-level AI security and privacy protection system

July 2019 was a key time for companies to build AI ethics, because firms like Tencent and Megvii put out their AI ethics rules one after another. In its report *The Ethical View of Technology in the Intelligent Era - Reshaping Trust in the Digital Society*, Tencent said AI technology ethics should include three things: technological trust, individual well-being, and social sustainability. The individual well-being part clearly makes sure users have digital well-being and work happiness, and it helps people develop freely when humans and machines work together. Megvii's *AI Application Guidelines* focus on user privacy and data security. They ask for strict protection of users' personal privacy and data security during R&D and use of AI solutions. This stops compliance risks from the start of business. All these are part of what companies do to hold the line on privacy protection at the enterprise level.

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The industry wants to improve field rules and agreements at its level, so it strengthens self-discipline by releasing initiatives, consensuses and conventions. In September 2018, the *Shanghai Initiative on the Safe Development of Artificial Intelligence* came out at the World Artificial Intelligence Conference. This initiative says clearly that AI development must take user data security as a prerequisite. It bans sacrificing privacy for development. It also asks to strengthen data protection laws and enrich AI technology routes. In May 2019, the *Beijing Consensus on Artificial Intelligence* started. It includes things like AI system data security, stopping data platform monopoly and setting up a data service withdrawal mechanism. In June 2019, the China AI Industry Development Alliance released the <Self-Discipline Convention for the Artificial Intelligence Industry (Draft for Comment)>. This convention tells enterprises to collect and use personal information based on the principles of "legality, legitimacy and necessity". It especially stresses strengthening privacy protection for special groups like minors and making sure data is secure through technical methods.

The country wants to define the macro-governance scope at its level. So, in June 2019, the National Professional Committee for the Governance of New-Generation Artificial Intelligence released *Governance Principles for New-Generation Artificial Intelligence - Developing Responsible Artificial Intelligence*. This document lists "respecting privacy" as one of the eight key principles. It asks to respect and protect personal privacy in AI development, and safeguard users' right to know and right to choose. It also asks to standardize the whole process of collecting, storing, processing and using personal information. And it tells people to improve the data authorization revocation mechanism, and strictly ban illegal acts like stealing, tampering with and leaking personal information. This sets the bottom line for AI security and privacy protection at the national level. Now, China has built a three-level normative system of "national-industry-enterprise". But there are still challenges. Relevant ethical principles came out not long ago, so they lack long-term practical testing. Also, people's awareness and attention to personal data protection are very different. This makes it hard to form social consensus. These problems need to be solved step by step in future practices.

3.3. Multi-level AI talent training system

Firstly, establish a cross-entity teaching guidance mechanism. It is recommended that the education department take the lead in establishing an AI Teaching Guidance Committee connecting universities and leading enterprises nationwide. Combining international technological frontiers and actual domestic industrial needs, and on the premise of safeguarding the characteristics and autonomy of university departments, the committee should coordinate the setting of AI academic degrees, discipline construction, and curriculum planning in universities and research institutions at all levels across the country, promoting hierarchical and classified training of AI talents to ensure that talent output matches industrial needs.

Secondly, set up an expert committee to clarify training standards. Relevant ministries and commissions should jointly establish an "AI Talent Training Expert Committee," with members including representatives from supervision departments, universities, and the industry. The committee is responsible for formulating the framework and core standards for the AI talent training system, giving play to the leading role of AI discipline experts and industrial experts in the multi-level AI talent training system and providing professional guidance in curriculum setting, practical teaching, and ability evaluation to ensure that training quality meets industrial development requirements.

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Thirdly, build an industry-education integration collaboration platform. Relevant ministries and commissions should take the lead in joining hands with key enterprises and universities to establish a national AI industry promotion platform. Drawing on the successful experience of joint R&D projects such as Japan's VLSI and the United States' SRC, the platform should carry out "industry-university-research-application" integrated talent training and technological research around key links of the AI industrial chain (such as chip design, algorithm R&D, and industry application), improving talents' practical capabilities through project practice while promoting the transformation of technological achievements to achieve mutual empowerment of talent training and industrial development.

Fourthly, optimize the quality and structure of talent training. To address the lag in university AI courses, promote the joint construction of dynamic curriculum systems by universities and enterprises, integrating the latest industrial technologies and cases into teaching content. Strengthen practical teaching links and establish corporate internship bases to improve students' practical abilities. At the same time, focus on the training of basic research talents and interdisciplinary talents, add basic courses such as original algorithms and chip localization, and set up interdisciplinary directions combining AI with manufacturing and medical care to alleviate the shortage of these two types of talents.

4. Conclusion

China’s AI sector requires structured approaches to grow sustainably and with top notch quality standards in place. Addressing the issue of dependence on foreign high end AI chips by implementing market driven reforms throughout the industry life cycle is crucial. Moreover, it is essential to define the government’s roles as both a "supervisor" and a "service provider " while enhancing safeguards, for the autonomous development of core technologies. The paper proposes enhancing the level normative system of "national industry enterprise" to address issues with poor data governance and insufficient privacy protection measures in place. To tackle the scarcity of AI professionals effectively suggest establishing cross entity teaching guidance and expert committees while creating platforms for industry and education integration to enhance talent training quality and structure. It emphasizes that future advancement should prioritize independence and standardization directives to ensure development. The paper recommends finding a balance, between innovation and risk management to advance China’s AI industry towards a more sophisticated and competitive growth model.

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